

REMARKS

In the specification, several paragraphs have been amended to correct minor typographical errors, as well as to correspond with the renumbered drawing labels.

In the amended drawings, the modified forms of construction have been separated, with the alternative forms renumbered to Figures 2 and 3. No new matter has been added.

Claims 12 – 16 have been added. Support for the additional claims can be found on at least page 7, lines 13 - 22.

Claims 1 – 16 are present in the subject application.

In the Office Action dated September 1, 2004, the Examiner has objected to the drawings, has rejected claim 6 under 35 USC §112, has rejected claims 1 – 5 and 7 under 35 U.S.C. §102(b), and has rejected claims 1, 2, and 6 – 11 under 35 U.S.C. §103(a). Favorable reconsideration of the subject application is respectfully requested in view of the following remarks.

Initially, the Examiner has objected to the drawings under 37 CFR 1.84(h)(5) because Figure 2 shows modified forms of construction in the same view. In light of the corrected drawing sheets labeling the second drawing as Figure 3, the Examiner is respectfully requested to reconsider and withdraw this objection.

The Examiner further objected to the drawings under 37 CFR 1.83(a) on the basis that the drawings fail to show the resonator structure recited in claims 4 and 6. This objection is respectfully traversed. Conventional features disclosed in the description and claims, where their

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detailed illustration is not essential for a proper understanding of the invention, may be illustrated in the drawing in the form of a graphical drawing symbol or a labeled representation (e.g., a labeled rectangular box). *See* 37 CFR 1.83(a). The resonator structures are represented, for example, by functional blocks 4 and 5 in Fig. 1. The specification, moreover, clarifies on page 7, line 31 through page 8, line 4 that the claimed structure is an implementation of elements 4, 5. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this objection.

Claim 6 stands rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement with respect to the perforated mass element. This rejection is respectfully traversed. The recited perforated mass element is described in the specification, at least on page 7, line 31 – page 8, line 4. Moreover, the perforated mass element is a conventional structure known to those having ordinary skill in the art. There is no requirement to provide a detailed written description of known structures. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Claims 1, 2, and 7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,295,861 to Tom et al. The Examiner takes the position that the Tom et al. patent discloses all the features recited within these claims. This rejection is respectfully traversed since the Tom et al. patent does not disclose, teach, or suggest the features recited in independent claim 1 of a sensor including a resonating structure having a resonant frequency dependent upon a *physical* characteristic of a gas in the atmosphere surrounding the structure. Rather, the Tom et

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al. patent discloses a device that detects the presence of a gas species by means of a differential quartz microbalance (QMB) arrangement. The gas species is detected as a result of a change in the resonant frequency of a piezoelectric device coated with a sensor material having an adsorptive affinity for the gas species. This change is caused by a change in the mass of the QMB resulting from the coating adsorbing the gas species. That is, the device of the Tom et al. patent measures the change in the resonant frequency of the piezoelectric crystal, and not the gas filling the cavity in which the crystal is located.

As discussed on original page 7, line 10 through page 8, line 18, the sensor element of the instant invention includes a resonator having a resonant frequency that varies with changes in the physical properties of the gas in the cavity, i.e., in the atmosphere surrounding the resonator. The sensor of the Tom et al. patent, in contrast, includes a catalytic sensor that, as discussed in the specification on page 2, lines 12 - 23, measures the change in resonance resulting from a chemical reaction, i.e., an interaction with the gas on a molecular level. This type of catalytic sensor is disadvantageous because species within the gas may irreversibly bind to the sensor material and thereby reduce the sensitivity of the sensor. The sensor of the instant invention overcomes this disadvantage by using *physical* detection principles rather than *chemical* detection principles. Specifically, by relating a resonant frequency to a physical property such as the velocity of sound through the atmosphere surrounding the resonator or the density of the gas surrounding the resonator, passive detection is achieved with little or no interaction with the gas on a molecular level. For example, as discussed on page 7, lines 10 - 19 of the specification, a

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Kundt resonator uses a standing wave pattern to determine the composition of the gas within the cavity. The presence of a pollutant is detected shifts the resonant frequency of the gas, enabling the detection of a pollutant within the sensor. The pollutant does not react with the resonating structure. Since the Tom et al. patent does not disclose, teach, or suggest the features recited within independent claim 1 as discussed above, this claim is considered to be in condition for allowance.

Claims 2 and 7, and new claims 12 – 16, depend, either directly or indirectly, from independent claim 1 and, therefore, include all the limitations of their parent claim. These dependent claims are considered to be in condition for allowance for substantially the same reasons discussed above in relation to their parent claim and for further limitations recited in the claims.

Claims 1 - 5 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,789,655 (Passeri). The Examiner takes the position that the Passeri patent discloses all the features recited within these claims. This rejection is respectfully traversed since the Passeri patent does not disclose, teach, or suggest the features recited in independent claim 1 of a sensor including a resonating structure having a resonant frequency dependent upon a physical characteristic of a gas in the atmosphere surrounding the structure. The Passeri patent discloses a fluid analyzer for determining the composition of a binary fluid mixture. The device uses a differential arrangement for measuring the transit time of acoustic waves within the two chambers. Specifically, the device operates by transmission of identical energy frequency

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signals through a reference fluid in a first chamber and a fluid mixture in a second chamber (see column 2, lines 13-24). The wavelength of those signals vary according to the various physical properties of the fluid. The device, then, works on the basis of variable wavelength of a fixed frequency signal, and not according to a variation in resonance frequency dependent upon a physical characteristic of a gas in a cavity. That is, the bimorph transmitting transducers of the described in the Passeri patent are not resonating structures as defined in the specification and recited in claim 1. Since the Passeri patent does not disclose, teach, or suggest the features recited within independent claim 1 as discussed above, this claim is considered to be in condition for allowance.

Claims 2 – 5, and new claims 12 – 16, depend, either directly or indirectly, from independent claim 1 and, therefore, include all the limitations of their parent claim. These dependent claims are considered to be in condition for allowance for substantially the same reasons discussed above in relation to their parent claim and for further limitations recited in the claims.

Claims 1, 2, and 6 - 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,321,588 (Bowers et al.) in view of U.S. Patent No. 6,684,683 (Potyrailo et al.). The Examiner takes the position that modifying the Bowers device with multiple cavities, a micromachined silicon structure, and a spring/mass element as taught by the Potyrailo et al. patent would have been obvious. This rejection is respectfully traversed since neither the Bowers et al. patent nor the Potyrailo et al. patent discloses, teaches, or suggests the features

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recited in independent claim 1 of a sensor including a resonating structure having a resonant frequency dependent upon a *physical* characteristic of a gas in the atmosphere surrounding the structure. The Bowers et al. patent discloses a device for detecting chemical substances using a plurality of surface acoustic wave (SAW) sensors arranged in an array. The sensors include piezoelectric crystals having resonant frequencies that vary as a function of the mass of the contaminant adsorbed onto the crystal surface. *See* col. 3, lines 20 - 22. As explained above regarding the Tom et al. patent, such as sensor chemically reacts with the gas, interacting with the gas at a molecular level. As a result, a species within the gas binds to the crystal, reducing the sensitivity of the sensor. In contrast, the sensor of the instant invention uses *physical* (not chemical) detection principles, including a resonating structure having a resonant frequency dependent upon a physical characteristic of a gas in the atmosphere within the sensor cavity. *See* the specification at page 7, line 10 through page 8, line 18. Specifically, by relating a resonant frequency to a physical property such as the velocity of sound through the atmosphere surrounding the resonator or the density of the gas surrounding the atmosphere, passive detection is achieved with little or no interaction with the gas on a molecular level.

The Potyrailo et al. patent does not compensate for the deficiencies of the Bowers et al. patent and similarly, does not disclose, teach, or suggest these features. The Potyrailo et al. patent shows an arrangement in which the output parameters of acoustic wave devices vary as a function of analyte concentration in, and thus the mass of, a coating deposited on a surface of those devices. *See* col. 3, lines 1 - 9. As explained above, such as resonator chemically reacts

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with species within the gas surrounding the sensor, interacting with the gas at a molecular level. As a result, a species within the gas binds to the coating, reducing the sensitivity of the sensor. In contrast, the sensor of the instant invention uses *physical* (not chemical) detection principles, including a resonating structure having a resonant frequency dependent upon a physical characteristic of a gas in the atmosphere within the sensor cavity, as required by the limitations of claim 1. See the specification at page 7, line 10 through page 8, line 18. Specifically, by relating a resonant frequency to a physical property such as the velocity of sound through the atmosphere surrounding the resonator or the density of the gas surrounding the atmosphere, passive detection is achieved with little or no interaction with the gas on a molecular level.

Since the Bowers et al. and the Potyrailo et al. patents do not disclose, teach, or suggest, either alone or in combination, the features recited within claim 1, as discussed above, these claims are considered to be in condition for allowance.

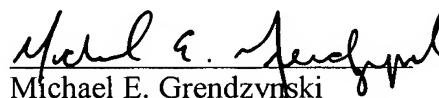
In addition to the foregoing, it would not be obvious to combine the Bowers et al. patent with the Potyrailo et al. patent to obtain the claimed invention. The Bowers et al. patent is concerned with improving energy performance of a portable sensor, whereas the Potyrailo et al. patent is concerned with characterizing and evaluating water permeabilities of members of combinational libraries. Thus, the Bowers et al. and the Potyrailo et al. patents are concerned with diverging applications and there is no apparent reason to combine their teachings other than prohibited hindsight derived from Applicant's own disclosure.

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In view of the foregoing, Applicants respectfully request the Examiner to find the application to be in condition for allowance with claims 1 - 16. However, if for any reason the Examiner feels that the application is not now in condition for allowance, he is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

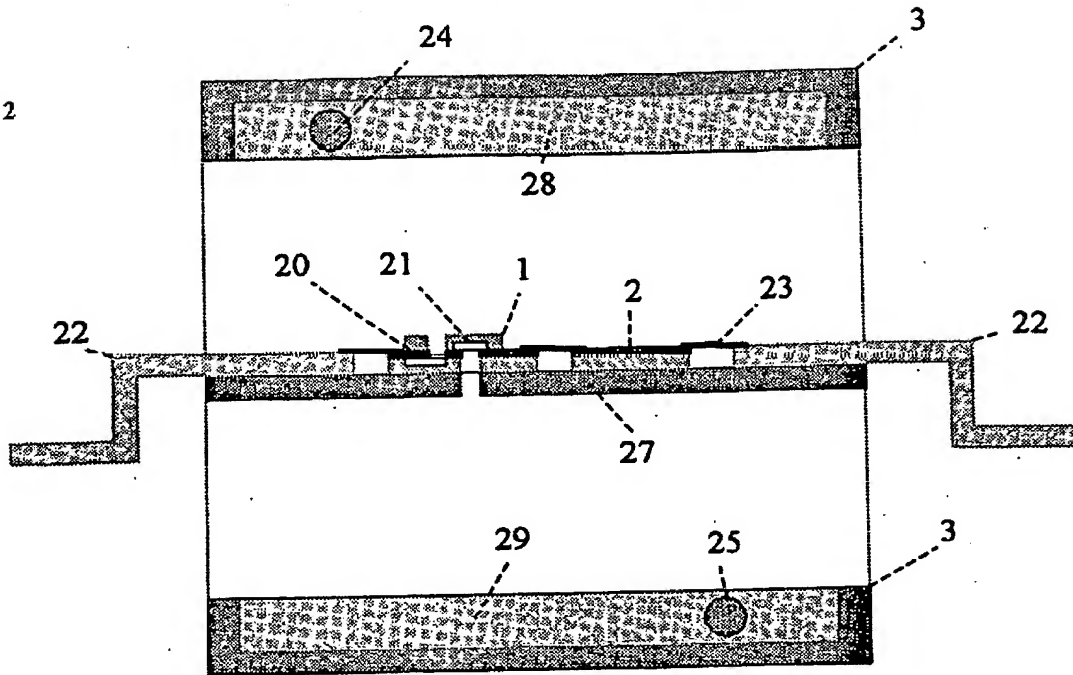
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Hand Delivered on: 12/01/04

Fig 2



Added
label
to figure

Fig 3

